EXPLANATION OF PLATE LXVIII.

Fig. 1.—Diagram of the plates of Tribrachyocrinus corrugatus, including the second radials articulated with the first radials.

Fig. 2.—Upper side view of the outer part of the Calyx, from a plaster cast obtained from the sandstone hollow cast (negative). The three second radials and a part of the small plates of the vault are seen.

Fig. 3.—Upper side view of the inner cast (sandstone) of the Calyx showing the negative casts of the three second radials and of a part of the small plates of the vault. Taken in the same position as fig. 2.

Fig. 4.—Under side view of the outer part of the Calyx, from a plaster cast as in fig. 2. Showing the three basal plates and the sub-radial B on the right of the fig.

Fig. 5.—Under side view of the inner cast of the Calyx, taken in the same position as fig. 4.

Fig. 6.—View of the symmetrical radial, showing the granulations of the surface. Double size.

Fig. 7.—Under side of the second radial showing muscular striæ. Double size.

Fig. 8.—Upper side of the same showing socket for the first article of the arm. Double size.

Fig. 9.—Side view of the same. Double size.

Fig. 10.—Medial section of figs. 6 and 7, arranged so as to show the place of the muscle and their relative position. Double size.

Fig. 11.—Section *pq.* of second radial. Double size.

Fig. 12.—Section *rs.* of same.

ON THE LARVÆ AND LARVA-CASES OF SOME AUSTRALIAN APHROPHORIDÆ.

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(Plates LXIX. and LXX.)

There are several instances of insect larvæ building a kind of shell, if not shell in structure, at least in form. In *Helicopsyche*, a phryganid (Trichoptera), the larva of which lives in the waters of warm countries, the shell is in the shape of an Helix, and is formed of agglutinated sand. This shell often includes bright minerals, such as quartz, garnets, amphibole, mica (New Caledonia.) In a classical instance, it is formed of small *Planorbis* (Westwood). In this country the female of a case-moth lives in a perfectly helicoidal shell apparently formed by agglutinated vegetable matter.

But these are not true shells like those of molluscs or serpulæ.

At the meeting of June last, our President, Mr. C. S. Wilkinson, exhibited helicoidal shells of insects found on the branches of some gum trees at the Hunter River. They are figured in connection with this paper, but were remains of the last year, and had no insects in them. Mr. Brazier found some at the North Shore years ago, but they do not seem to be common everywhere. However, Mr. Ramsay found an empty specimen at Manly, probably of the same species.

Similar shells, but of a conical shape, of two or three different species, are rather common around Sydney, especially on white gum (*Eucalyptus hæmastoma*, var. *micrantha*) and stringy bark (*Euc. capitellata*); it is those which enabled me, with the help of Mr. Macleay, to find the genus to which, most probably, the three or four mentioned species belong. Those are true shells, much resembling some living and fossil serpulæ.

The shell is fixed on the branch, generally a little or immediately above the insertion of a leaf; and its opening is turned upwards. The position of the larva in it is reversed, its head being placed downwards, except in the helicoidal shell, where the insect lies horizontally for the greater part of its larva life. In both instances it follows that the larva, instead of presenting its head at the entrance of its shell, like a mollusc, presents its hind region. The mouth of the larva is transformed into a suctorial apparatus, with which it pierces the bark of the stem, and sucks the sap. For that purpose the shell is provided with a longitudinal slit. It occasionally moves itself backwards and emits a drop of clear water at the entrance of its shell, which is habitually half or nearly full of water. In warm weather especially, the production of water is increased, and drops are seen falling from the top of the shell. A well-known species of Aphrophora, *A. Goudoti* (Benn), of Madagascar, also lives on trees, but does not build a shell. In the state of larva, as well as of imago, it emits a large quantity of clear water. Mr. Goudot says that on a warm day he could obtain in half-an-hour about a bottle-full of water produced by about sixty insects. (1.)

(1.) Bennet. Proc. Zool. Soc., Lond., 1833, and Proc. Nat. Hist. Soc., Mauritius, 1832.

This phenomenon does not occur only in this order of insects. It is said that a kind of ant in Brazil absorbs water, and emits it in abundance. ("Nature," 1881.)

The lime which enters into the composition of the shell is evidently provided from the sap of the tree, and, according to Professor W. A. Dixon, the stems and leaves of gum trees are rich in lime. From a rough assay made by treating the shells with diluted hydrochloric acid, I obtained at least seventy-five per cent as the proportion of carbonate of lime, the insoluble remains being considered as chitinous matter.

The weight of the ornamented shell, the most common species, is about 4 centigrammes, whilst that of the larger one is 6 centigrammes.

The imago was obtained about the end of September, and was identified by Mr. Macleay as belonging to the genus *Ptyelus* nearly allied to *Aphrophora*.

When it is ready to undergo its last change the larva gets out of the shell in the middle of a frothy mass of water like the cuckoospit (*Aphrophora spumaria*, Linn.), and shortly after leaving its skin, appears in the shape of imago.

About the same time, I received from Mr. John Mitchell of Bowning, some living specimens which were far less advanced than those around Sydney, showing that they were at least one month or two later.

It is not known when they deposit their eggs, but it is probable that they live for some time in the perfect state, as they are still to be found now (end of November) on the trees.

These little jumpers don't make great use of their wings and consequently don't go very high on the trees although they run very quickly; their shells are found from two feet to six or seven feet above the ground.

Ten months at least ought probably to be reckoned as the time the insect lives in its larval state, at the same time growing its shell. During that period it apparently undergoes numerous changes, as in the three last months of the life of the larva, it passes through at least six distinct stages including the last one.

By perusing the appended plates we will go rapidly through the details of this study. The scale is marked on the figures.

Plate 69, fig. 1, 1a, 1b and 2. Helicoidal shell. Occurs dextrorsum or sinistrorsum round the stems, section ogival, showing a longitudinal costa. Shell finely striated with lines of growth. Helix of two rounds and one half, diameter 7½ millimetres (fig. 1, etc.) The shell represented by fig. 2 differs somewhat in general appearance from fig. 1, but the striation is the same and it is probably the same species. The last one was found at Manly by Mr. Ramsay.

Plate 69, fig. 3, 4, 6, 8, 8a, 11. The commonest species. Is easily distinguished by the granulations of its lines of growth. These exhibit ornamentations which recall some forms of wall stalactites (fig. 8 and 11.) This shell is also very dark, especially on the tubercles. These ornaments are irregularly disposed in front of the shell, but on each side follow each other, forming a continuous serrated costa Length of shell, 15 millimetres. Attached to the stem along its whole length. Plate 70, fig. 1, 2, 4, 5, 10, represent five different stages of the larva enlarged 10 times and on a smaller scale, the imago from the ornamented shell, (fig. 3 etc.) Fig. 1, as found in July, 3 millimetres. Fig. 1a the shield shaped anal plate enlarged. It acts as an operculum. Fig. 10, the imago drawn only double size. Length of body, 7½ millimetres. Alar expansion, 14½ millimetres. Thorax and scutellum light green and transversely striated. Among the imagos obtained from the common shells there are some much smaller, somewhat differing in shade, having the wings better marked than the others, which are probably the males. Length of body, 4½ millimetres. Alar expansion, 10½ millimetres.

Plate 69, fig. 3a, 10 represent the shell of another species, the largest among the species described. Section ogival, rounded, and narrower at the mouth. The surface is marked with lines of growth and is somewhat lustrous with a light shade of buff, darker near the mouth. These shells soon lose their colours under the sun, those of the preceding year being perfectly white. It is obvious that the younger lines of growth, near the mouth of the shell, are likely to exhibit the colours in a fresher state. Fig. 10 represents a shell which has been broken and mended. A piece of the broken part is seen cemented on the surface in front of the shell. Length 22 to 25 millimetres. Detached from the stem and bent for about 9 millimetres.

Plate 70, fig. 6, represents the larva of the same enlarged five times, as found in July. This larva shows no plates like those represented figs. 1 to 5.

Plate 69, fig. 3b, 4(?), 5, 7 and 9, represent a smaller shell much resembling the preceding one, being only from 15 to 18 millimetres in length. The section is generally more distinctly ogival and the shell presents in front a longitudiual angle, but, as well as in the preceding species the mouth is round or nearly so. A peculiarity which distinguishes this shell is a narrowing which is situated at two or three millimetres from the mouth. From this narrow space to the mouth the shell is dark, nearly black. The general colour is a greyish white. The shell is bent on its upper part and detached from the stem as the preceding one. The larva resembles the one represented fig. 6, plate 70.

From these I obtained a perfect insect apparently differing from the common species by a lighter shade on the wings. Fig. 7 represents an instance of this shell taking a half round.

Plate 70, fig. 7, represents a hind tibia of larva with three articulations, two claws and rings of setæ. This figure and the following ones apply to the different larvæ examined, but especially to the common species.

Fig. 8a, 8b, represent the inferior lip composed of three divisions forming a tube for the setæ, which are four in number (mandibles and maxillæ.) The maxillæ are serrated fig. a,b.

Fig. 9. Antennæ of larva terminating in asingle seta short and stout.

In conclusion I should say that much remains to be done next year towards the study of these little insects.

In the dry parts of the interior it is probable that the water contained in these shells is resorted to for drinking by the ants so numerous in Australia, as if it was a specialty among the small homopterous insects to provide during their life for the *Formicidæ*.

Other insects inhabit the interior of the shell after it has been left by its builder; small cockroaches take occasional refuge in it. It is often also occupied by a small spider.

The larvæ are attacked by small black flies which perhaps deposit an egg or two in the young larva, the product of which feeds on it and ultimately takes its place. I found the pupa of this fly in a black hairy cocoon, but have lost the perfect insect. Similarly some *Coccidæ* are attacked by small *Diptera* and *Hymenoptera.*

NOTES AND EXHIBITS.

The Hon. James Norton exhibited male and female cones of *Araucaria Cooki*, now to be seen in full fructification in the North Eastern Division of Hyde Park. Mr. Norton observed that this tree in its earliest stages was not distinguishable from *Araucaria excelsa*, but when full grown it was more dwarf and compact. As in the case of *A. excelsa*, the male cones grow at the ends of the leaf spires, and the female are produced on the higher branches, but the latter are apparently smaller and more clustered.

Dr. George Hurst exhibited an egg of *Scythrops Novæ Hollandiæ*, taken from the ovarium of a bird shot this month at Kempsey. He mentioned that the only other specimen of this egg ever recorded was obtained in a similar manner and described in Gould's Handbook of the Birds of Australia.

The President exhibited, for Mons. F. Ratte, a number of beautiful drawings, illustrative of his papers; and also a box containing carefully mounted specimens of the insect shells referred to, which have been presented to the Australian Museum.

The President also exhibited four specimens of the shell-like covering of a species of *Phryganea.* These are built up entirely of small round nodules of brown iron ore, fastened together by a silky web. They were obtained on the north end of New Caledonia, by Dr. Storer, in a creek flowing over rocks composed of iron ore.

The President submitted a lithograph of a new fossil plant, found by Mr. R. M. Johnston, of Hobart, in the carboniferous beds of the Jerusalem Basin, Tasmania. It has been named by the discoverer *Lepidostrobus Mülleri.*